

CLAIMS

What is claimed is:

1. A method of designing a roller cone drill bit, comprising:
 - 5 (a) calculating force balance conditions of a bit;
 - (b) defining design variables;
 - (c) determining lower and upper bounds for the design variables;
 - (d) defining objective functions mathematically as a function of the design variables;
 - 10 (e) defining constraint functions mathematically as a function of the design variables;
 - (f) performing an optimization means; and
 - (e) evaluating an optimized cutting structure by modeling.
- 15 2. The method of Claim 1, wherein the design variables include variables from a group consisting of journal angle, cone-profile angle, offset angle, tooth crest length, radial position of a center of the crest length, and tooth angles.
- 20 3. The method of Claim 1, wherein the objective functions are defined by:
$$\text{Obj} = (V_1 - V_m)^2 + (V_2 - V_m)^2 + (V_3 - V_m)^2$$
wherein $V_m = (V_1 + V_2 + V_3)/3$ and V_1 , V_2 and V_3 are volumes removed by cones 1, 2 and 3, respectively.
- 25 4. The method of Claim 1, wherein a lower bound of a tooth crest length is determined by tooth strength.